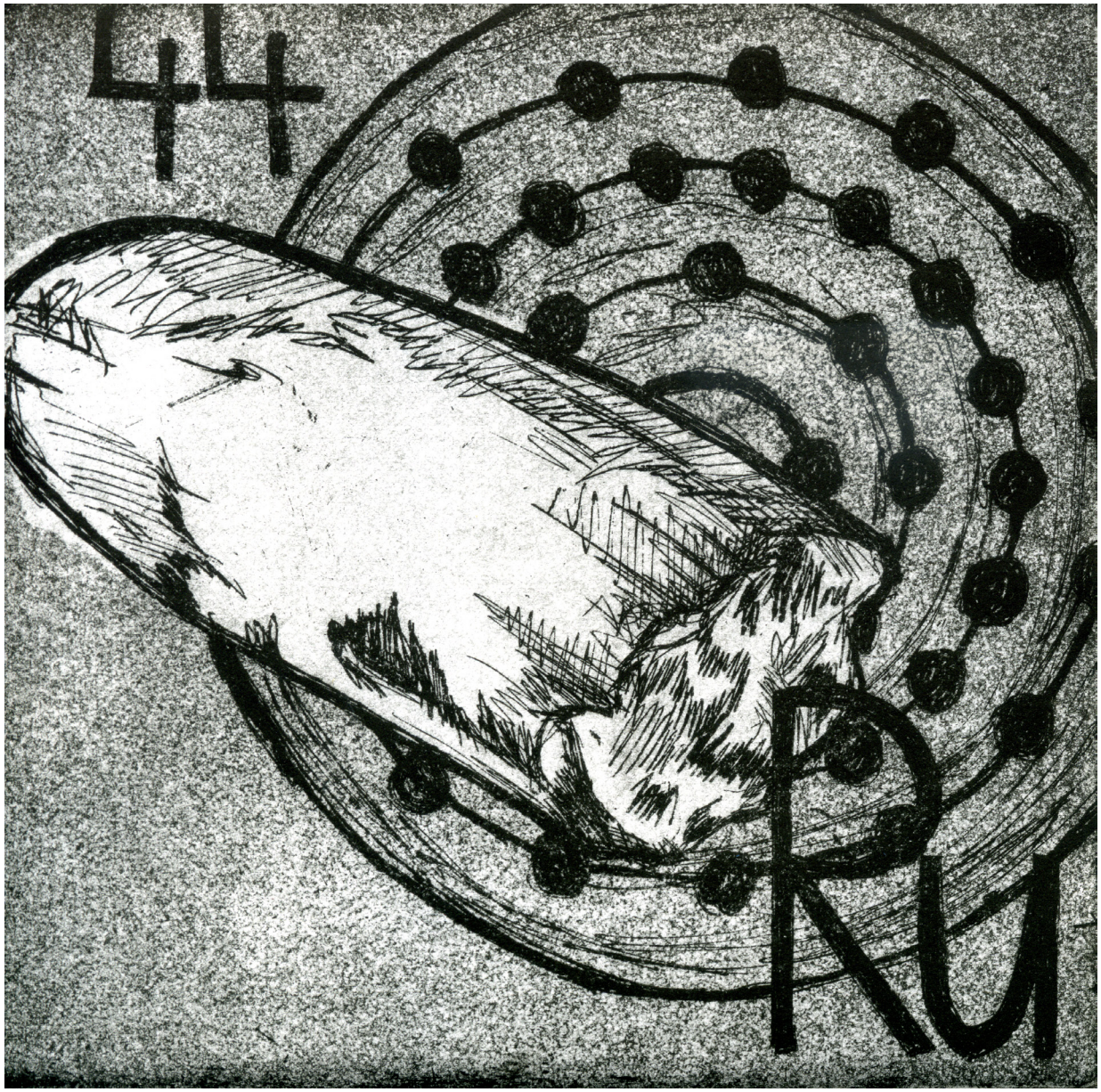

NICKI BURNS

RUTHENIUM

Element Symbol: Ru
Atomic Number: 44

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RUTHENIUM

Element symbol: Ru
Atomic number: 44

The element ruthenium is named after Ruthenia. This word is a Latin rendering of the historical territory of Rus, which today is formed with parts of Belarus, Ukraine, western Russia,northeastern Slovakia and eastern Poland.

Ruthenium was discovered in 1844 by Karl Karlovitch Klaus, then an unknown professor at the University of Kazan. Klaus could be considered the creator of the chemistry of the platinum metals because of his extensive investigation of rhodium, iridium, osmium, and to a lesser extent, palladium and platinum.

Ruthenium is the 74th most abundant metal on Earth and is generally found in ores with the other platinum group metals in the Ural Mountains and in North and South America. Roughly 12 tonnes of ruthenium is mined each year. Ruthenium is also a fission product of ^{235}Uranium, however the extraction from used nuclear fuel is complicated, expensive and also results in radioactive isotopes of ruthenium.

Ruthenium has several applications. An alloy containing small amounts of ruthenium with gold increases the stability of gold in jewellery. It is also used in some advanced high-temperature single-crystal superalloys with applications including the turbine blades in jet engines. The “RU” nib in the famous Parker 51 fountain pen was a 14K gold nib tipped with 96.2% ruthenium and 3.8% iridium.

106Ruthenium, a β-decaying isotope, is used in radiotherapy of eye tumours, mainly malignant melanomas of the uvea. There are two ruthenium compounds undergoing clinical trials against metastatic tumours and colon cancers.

Ruthenium and its compounds exhibit good catalytic activity. Grubb’s Catalyst, an organometallic ruthenium complex containing carbene, alkylidene and triphenylphosphine ligands, is a highly efficient catalyst for olefin metathesis with important applications in organic and pharmaceutical chemistry. Professor Robert H. Grubbs shared the 2005 Nobel Prize in Chemistry for this work.

There is a significant amount of academic and commercial research being undertaken in Australia on ruthenium and its compounds. Dyesol Ltd is collaborating with CSIRO to develop high-performing ruthenium based dyes for use in dye solar cell technology. DSC technology can best be described as ‘artificial photosynthesis’ using an electrolyte, a layer of titania (a pigment used in white paints and tooth paste) and ruthenium dye deposited on glass, metal or polymer substrates. Light striking the dye excites electrons which are absorbed by the titania to become an electric current many times stronger than that found in natural photosynthesis in plants. This technology produces electricity more efficiently than conventional silicon based photovoltaic technology, even in low light conditions and can be directly incorporated into building by replacing conventional glass panels or metal sheets rather than taking up roof or extra land area.

Provided by the element sponsor Dr Stephen Grocott

ARTISTS DESCRIPTION

A precious metal in the platinum group, ruthenium has minor uses in platinum and palladium alloys to make wear-resistant electrical contacts as well as designer sunglasses, jewellery and watches. Half of a pure electron-beam remolded ruthenium bar is the focus of this print, shiny and bold, like the metal itself.

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